and only a few eggs succeeded in fixing themselves to the objects introduced. When the currents were strong, the males were seen not only to swim nearer the bottom but to expel longer ribbons of milt, which reached the bottom before getting dispersed and remained visible sometimes for ten minutes. On gently expressing a male under the water it was never possible to expel so fine or so short portions of milt as escaped naturally, but it was extremely easy expelling a ribbon from 18 inches to 3 feet in length, measuring 2 lines across and 1 line in thickness. Such ribbons fell to the bottom and remained almost unchanged for nearly two hours; they then assumed a segmented appearance, and in about three hours and a half had all but disappeared.

Eggs were allowed to escape into a vessel containing fine sand, and into another containing mud. The eggs after being fertilised underwent the early stages of development, but either owing to their moving freely about with the sand particles or owing to their getting coated over with the sand and mud their development was arrested. I have not yet determined finally if the development is arrested when the eggs are detached while development is proceeding, but this seems extremely probable.

When at Ballantrae I noticed that the trammel nets secured often more males than females. Mr. Wilson, fishery officer at Girvan, informs me that the ripest fish are caught in the trammel nets, while most of the unripe fish are obtained in the drift nets, and that at the end of the fishing season there are about three males taken for every two females, indicating not necessarily that the males are more abundant than the females, but rather that the males remain longer on the spawning ground; and Mr. Wilson believes that herring prefer quiet water free from strong currents when spawning, and that when the weather is fine the herring remain long upon the bank and deposit their spawn leisurely, but when there are strong currents they either hurry the spawning process or disappear into deep water.

As to artificial fertilisation and hatching I found, after many experiments at Ballantrae, that the best results were obtained when both the male and female were held under water while the milt and ova escaped, *i.e.* when the natural process of spawning is followed.

An ordinary wooden tub was obtained and filled with sea-water. Into this a small quantity of milt was expressed, the male being held completely under water while the milt escaped. A glass plate was then held about four inches beneath the surface of the water, and, the female herring being held about one inch beneath the surface, by gentle pressure the eggs readily escaped in the characteristic narrow beaded ribbon, and, by moving the fish over the surface of the glass, either a close or an open network could be formed. At first, where one loop crossed another, the eggs were two or more layers thick, but, either owing to the weight of the eggs or the gentle currents set up in the water, before a few minutes had elapsed, the eggs formed a single and almost continuous layer, the network arrangement having disappeared. The plate was then allowed to rest for two or three minutes at the bottom of the tub, and a few short ribbons of milt were again introduced. After moving the plate once or twice across the top of the tub in order to wash off any scales that were adhering, it was placed either in a hatching or a carrying box. Many thousands of ova treated in this way contain extremely active embryos, which are expected to hatch on March 22 or 23.

Prof. Ewart exhibited a number of specimens showing herring eggs attached to stones, seaweeds, and sea-firs, and some of the herring fry hatched on March 24 from the eggs artificially fertilised on March 8.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

OXFORD.—The electors have awarded the Radcliffe Travelling Fellowship after examination to Mr. J. E. Blomfield, B.A., late Natural Science Demy of Magdalen College, and now of University College Hospital, London. The Fellowship is of the annual value of 200*l.*, and tenable for three years provided that the Fellow travels abroad for his improvement in the study of medicine. This is the fourth time in the last five years that this prize Fellowship has been won by a student of Magdalen College.

CAMBRIDGE.—From the report of the last Local Examinations it appears that the answers in pure mathematics exhibited considerable improvement, while in applied mathematics the work was inferior, and much of the teaching in statics was imperfect, and not based on mathematics. In chemistry great inequality was shown, some centres sending uniformly good work, others being very inferior. The practical work is better done than the theoretical. The teaching of experimental physics is still very ineffectual in its results. In the senior paper in electricity and magnetism only two of the candidates showed any proof of accurate knowledge or scientific training.

In biology the answers were, on the whole, not good, yet at some centres candidates did extremely well. In botany vegetable physiology showed improvement, but floral diagrams are not sufficiently used. In zoology the candidates seemed to have no idea of the relative value of facts. In physical geography a marked absence of scientific method was noticeable in the answers; great ignorance of meteorological terms used in most daily papers was manifested.

The Cambridge Local Lectures have made good progress in the past session, much good having resulted from the conference of local committees and lecturers held last year. In a number of centres local associations have been formed for putting the lectures on a permanent basis. At Derby an Artisans' Higher Education Society has been formed, the subscription being very low. At the Midland Railway works the large mess-rooms have been utilised in giving short lectures to arouse interest among the men, Prof. Teall lecturing on chalk, Mr. Bemrose on the transit of Venus, Mr. Heycock on digestion, respiration, &c., and the men have always been appreciative. In the Newcastle district much eagerness has been shown by pitmen to attend the lectures, often at great personal cost and inconvenience. The cost, indeed, is so great as to form an obstacle of serious magnitude, and it is found that the desire for lectures is such that the overcoming of financial difficulties would lead to an enormous extension of the work. Efforts are being made to get the rules of the Trades Unions altered so as to enable them to contribute towards the cost of the lectures.

It is now proposed to constitute an examination in French or in German as the additional subjects required of candidates for honours degrees, unless the candidates choose rather to pass the General Examination for the B.A. degree. This change would be welcomed by the large number of students to whom the study of works in French and German would be an important aid in their Tripos subjects.

SCIENTIFIC SERIALS

THE *Journal of Botany* for March contains the conclusion of Mr. T. Hick's valuable paper on protoplasmic continuity in the Florideæ. In quite a number of distinct genera belonging to this class he has now traced connecting threads between the protoplasm from cell to cell. He regards these threads as permanent and essential structures, normally present in all parts of the thallus from the oldest to the youngest, not restricted to special localities and special cells.—Some details of the life-history of a rare and little-known British plant, *Lithospermum purpureo-cæruleum*, are contributed by Mr. Jas. W. White.

American Journal of Science, March.—Experimental determination of wave-lengths in the invisible prismatic spectrum, with plate, by S. P. Langley.—The Quaternary gravels of Northern Delaware and Eastern Maryland, with map, by Frederick D. Chester. From a careful survey of this region the author infers that the peninsula became depressed at least 350 feet towards the close of the Glacial period, when the estuary thus formed received the discharge of the Delaware River, which pushed its way across the present States of Delaware and Maryland to the head of the Chesapeake. By this current and the subsequent distributing action of the waves the red gravel was deposited. Later on the land began to rise, the violence of the flood was abated, and the northern glacier gradually broke up. During this period the Philadelphia Clay was deposited, and the boulders distributed over the estuary by the icebergs from the glacier. The land continuing to rise, the shoal gravels were piled up by the waves and tides, the river began to assume its present channel, and the Delaware and Chesapeake were finally parted.—On the identity of scovillite with rhabdophane, by G. J. Brush and S. L. Penfield.—A theory of the recent sun-glows, by H. A. Hazen. The author attributes the phenomena to the presence of watery vapour, ice

crystals, or frozen water particles under a peculiar form in a rarefied atmosphere at a low temperature.—On the topaz and associated minerals found at Stoneham, Maine, by George F. Kunz.—A contribution to the study of the geology of Rhode Island, with map, by T. Nelson Dale.—On the crystalline form of the supposed herderite from Stoneham, Maine, by Edward S. Dana.

SOCIETIES AND ACADEMIES

LONDON

Chemical Society, March 20.—Dr. W. H. Perkin, president, in the chair.—The following gentlemen were elected Fellows:—F. W. Brown, H. Cave, F. W. Fleming, E. E. Graves, A. E. Lewis, J. E. London, G. A. Parkinson, S. Smith, G. Tunbridge, T. U. Walton.—The following papers were read:—Note on the preparation of marsh gas, by Dr. J. H. Gladstone and Mr. A. Tribe. In 1873 (*Chem. Soc. Journ.* xi. 682) the authors described a reaction in which pure marsh gas was obtained by the action of the copper-zinc couple on methyl iodide in the presence of alcohol. The loss of the methyl iodide was considerable, 23 to 50 per cent. In the present note the authors describe a slight modification by which this loss can be prevented. It consists essentially in passing the gas evolved through a vertical tube twelve inches long filled with the copper-zinc couple.—On the action of dibrom-α-naphthol upon amines, by R. Meldola. The author has investigated the action of dibrom-α-napthol upon anilin, orthotoluidin, paratoluidin, and α-naphthylamin. With anilin a body was obtained which proved to be β-naphthoquinonedianilide; similar bodies were obtained with toluidin, &c. This reaction therefore furnishes a simple method of obtaining these quinoneimides in large quantities. The author also discusses the bearing of this reaction on the constitution of these bodies.—Note on the existence of salicylic acid in the cultivated varieties of pansy and in the Violaceæ generally, by A. B. Griffiths and E. C. Conrad. The authors state that they have extracted salicylic acid from the leaves, stems, and roots of the pansy; apparently none exists in the flowers.

Zoological Society, March 18.—Prof. W. H. Flower, F.R.S., president, in the chair.—Mr. Tegetmeier exhibited specimens showing a variation in the colour of the feet of the pink-footed goose (*Anser brachyrhynchus*).—A communication was read from Sir Richard Owen, K.C.B., on the extinct birds of the genus *Dinornis*, forming the twenty-fifth of his series of memoirs on the subject. The present paper gave a description of the sternum of *Dinornis elephantopus*.—Mr. J. B. Sutton, F.Z.S., read an account of the results of his investigations of the more important diseases which affect the carnivorous animals living in the Society's Gardens.—Mr. J. W. Clark, F.Z.S., exhibited and read an account of three skulls of a sea-lion from the east coast of Australia. The largest, that of an adult male, had been exhibited, together with the stuffed skin, at the Fisheries Exhibition last year, where it had been named *Arctocephalus cinereus*, Gray. The object of the paper was to trace the history of the species for which the name *Otaria cinerea* had been suggested by Péron in 1816, and to show, by comparison with the type skull at Paris, that these specimens had been rightly referred to.—A communication was read from the Rev. O. P. Cambridge, in which he gave descriptions of two new genera of spiders proposed to be called *Forbesia* and *Regillus*.

Physical Society, March 22.—Prof. Guthrie, president, in the chair.—The President announced that a meeting of the Society would be held on May 10 at Birmingham, by invitation. The next meeting will be on April 26.—Prof. S. P. Thompson then read a paper by himself and Mr. C. Starling on Hall's phenomenon. The authors had not agreed with Hall's explanation of his observed effect, and last year undertook experiments to investigate its nature. They employed a strip of tinfoil gummed on a mahogany board with vaseline, which, being soft and a non-conductor, answers well for this purpose. A top-shaped electromagnet with a pointed pole was used on one side of the strip to try the effect of a pointed pole. The current was obtained from accumulators. They found that the equipotential lines in the strip, which before magnetisation ran straight across the strip, were slightly curved on either side of the pointed pole after magnetisation. This curving was interpreted as a reduction of resistance in the strip at the pole, and subsequent tests of the resistance of the strips in a magnetic field confirmed this view. Iron strips, however, showed a slight *increase* of resistance. It was also found that an effect similar to Hall's was got by placing the pointed pole so that this change of resistance was not symmetrical with respect to the points in the strip to which the galvanometer was connected. But inasmuch as the effect was not reversible by reversing the magnetism, it was not Hall's effect, which they failed to obtain with the narrow pointed pole. In their experiments thermo-electric effects were eliminated, and their results, though different, do not clash with those of Mr. Bidwell.—A paper by Mr. Herbert Tomlinson on the same subject was read by Prof. Reinold. The author drew attention to a similarity between Hall's table of results and one of his on the effects of mechanical stress on electrical resistance.—Mr. Shelford Bidwell read a note on Hall's effect in tin, in which he showed that a small extension and a greater extension produced opposite thermo-electric effects in tin wires.—In answer to Prof. Guthrie and Mr. Walter Baily, Prof. Thompson stated that the change of resistance he had observed was sub-permanent, and died away in about half an hour. He believed it to be producible on the strip when no current traversed it.—Prof. S. P. Thompson then read a paper on some propositions in electromagnetics, giving a connected series of explanations throwing light on the laws of electromagnetics, and based on a practical experiment.

Royal Microscopical Society, March 12.—Rev. H. W. Dallinger, F.R.S., president, in the chair.—Mr. Glaisher introduced Mr. Dallinger to the meeting on taking his seat for the first time as president, and the latter made a short address in acknowledgment.—Mr. J. Mayall, jun., described the improved Nelson-Mayall lamp, in which the burner could be brought down very close to the table; also Boecker's improved freezing microtome.—Mr. Crisp exhibited Schieck's microscope with fine adjustment made by tilting the stage at one end; also Watson's rotating stage, Collin's set of fish-scales, and a slide of a hydroid polyp with extended tentacles, mounted by Mr. E. Ward.—Notes were read: On a multiple eye-piece by Mr. E. H. Griffith, in which eye-lenses of different powers were mounted on a rotating disk; by Col. O'Hara on some peculiarities in the form of blood-corpuscles; and a communication from a Microscopical Society recently formed at San Francisco, and consisting of ladies.—A paper was read by Mr. T. B. Rosseter describing some peculiar annular muscles in *Stephanoceros*; also by Prof. Reinsch, who stated that he had found bacteria and non-cellular Algæ to exist in considerable numbers on almost all copper and silver coins which had been for some time in currency; also by Mr. G. Massee on the formation and growth of cells in the genus *Polysiphonia*, being a further contribution to the evidence on the continuity of protoplasm through the walls of vegetable cells; also by Prof. Abbe on the distance of distinct vision, in which he pointed out the erroneous inferences which had arisen from the practice of expressing the amplifying power of a lens by reference to a fixed distance of vision (10 inches, or 250 mm.).—Some new forms of cells devised by Mr. Wilks and made by Mr. E. Ward for mounting without pressure in balsam were also exhibited and described.

Royal Meteorological Society, March 19.—Mr. R. H. Scott, F.R.S., president, in the chair.—Messrs. W. Baily, M.A., W. L. Blore, A. L. Ford, H. Leupold, A. F. Lindemann, F.R.A.S., and Rev. E. B. Smith were elected Fellows of the Society.—The President read a paper entitled brief notes on the history of thermometers. He stated that the subject had been handled in a comprehensive manner by M. Renou a few years ago in the *Annuaire* of the French Meteorological Society, so that he should merely mention some of the leading points. The name of the actual inventor of the instrument is unknown. The earliest mention of it, as an instrument then fifty years old, was in a work by Dr. R. Fludd, published in 1638. Bacon, who died in 1636, also mentions it. The earliest thermometers were really sympiezometers, as the end of the tube was open and plunged into water, which rose or fell in the tube as the air in the bulb was expanded or contracted. Such instruments were of course affected by pressure as well as temperature, as Pascal soon discovered. However, simultaneously with such instruments, thermometers with closed tubes had been made at Florence, and some of these old instruments were shown at the Loan Collection of Scientific Apparatus at South Kensington in 1876. They are in the collection of the Florentine Academy, and in general principle of construction they are identical with modern thermometers. Passing on to the instrument as we now have it, Mr. Scott said that most of the improvements in construction in the earliest days of the instrument were due to